



Coast Watchers Community Science



# ANNUAL COAST WATCHERS REPORT

2022



Prepared by:

Lake Huron Coastal Centre



**coast watchers**  
COMMUNITY VOLUNTEER PROGRAM



**LAKE HURON  
COASTAL CENTRE**

This program would not have been possible without generous funding from sponsors and program partners. Thank you for continuing to support the Lake Huron Coastal Centre and its core mandates of educating members of coastal communities in the topics of water quality, biodiversity, climate change, and coastal processes.

The 2022 year of the Coast Watchers program was generously sponsored by:



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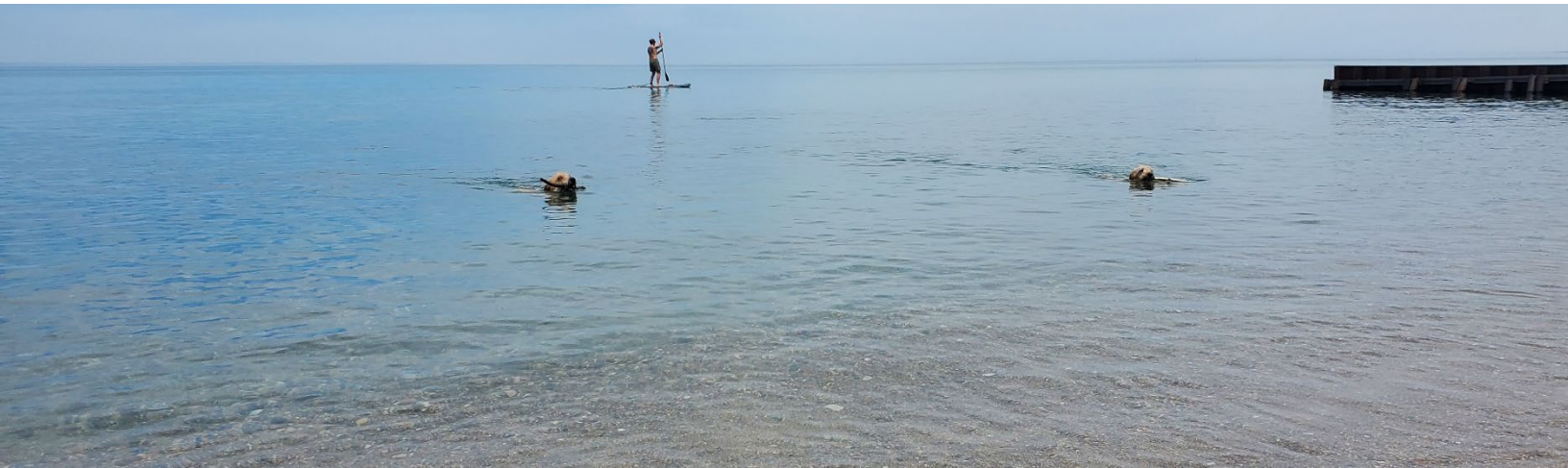


## Introduction

Coast Watchers volunteers are the “eyes and ears” of Lake Huron’s coast. With Coast Watchers volunteers collecting information systematically and consistently along Lake Huron, it is possible to track long-term trends in shoreline conditions and act towards resiliency and sustainability in the short-term.

The quality of Lake Huron’s water and shoreline has come into question in recent years as plastic pollution, shoreline erosion and climate change cause concern for the coastal environment. Various agencies have collected segments of information related to environmental quality concerns along the coast, but the data collected is often limited to ‘snapshots’ in time. The difficulty is that local conditions can change quickly. Lake Huron’s immense 6,170 km of shoreline is the longest of all the Great Lakes, and therefore cannot easily be monitored in detail by any one agency; This is where the role of citizen scientists or *community scientists* becomes crucial in recording changes along the coast. The Coast Watchers program has a grassroots approach to data collection where community champions monitor changes to the shoreline. The Coast Watchers Program Coordinator works to analyze and share the data with environmental organizations, government agencies, corporate partners, and the public.

The Coast Watchers program is designed to engage members of the community to take an active part in observing and improving the quality of nearshore waters and beaches. Community volunteers are trained to record data on atmospheric conditions, wildlife, plastic pollution, algae blooms, erosion, storm damage, and human activity. Volunteers also have access to educational resources on coastal related topics (e.g., Species at Risk, invasive species, plastic pollution, etc.) provided by the Lake Huron Coastal Centre (LHCC).



## Methods

### Coast Watchers Program

The major factor defining Coast Watchers is its basis of coastal community scientist volunteers, sometimes also referred to as “citizen scientists”. Community science is becoming a significant contributor and a valued source of data collection. “A community scientist is an individual who voluntarily contributes their time, effort, and resources toward scientific research in collaboration with professional scientists or alone. These individuals do not necessarily have a formal science background” (SciStarter.org, 2020). The success of the Coast Watchers program relies on dedicated and reliable volunteer community scientists to remain successful in providing a valuable long-term data set.

Data is generally collected once per week between May 1<sup>st</sup> and October 31<sup>st</sup> every year. Participants are asked to collect data preferably on the same day at the same time every week. If a volunteer is unable to record their observations, they are asked to share data collection duties with a trusted friend or family member, yet exceptions are made for seasonal residents. Participants submit data using the online mobile application which is inputted into a long-term dataset for future analysis. Coast Watchers are given a personalized number (i.e., CW001) to respect the privacy of all volunteers. Their number is referred to when writing about specific volunteers in all public reports.

### Volunteer Recruitment

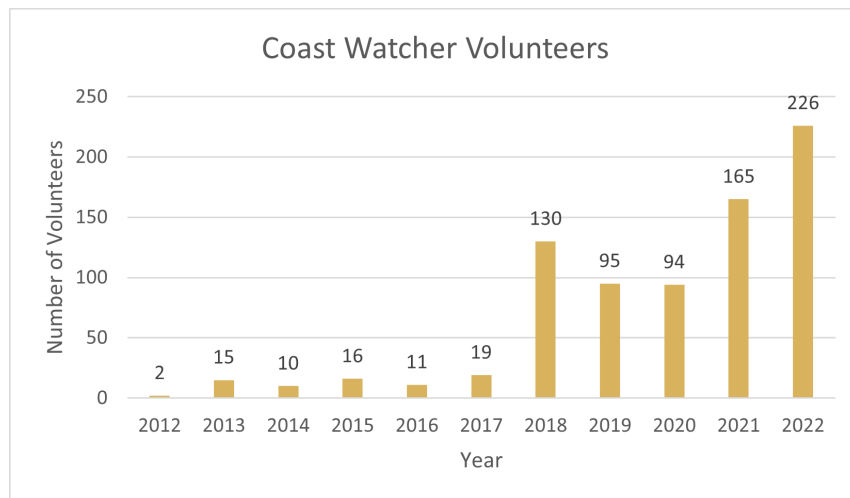
Volunteer recruitment begins early in the new year, with many returning volunteers from previous years of the program. New volunteers are typically recruited through several avenues including social media, newsletters, radio interviews, local newspapers, and word of mouth. Coast Watchers is often highlighted in other LHCC programs, presentations, and webinars which can lead to registrants. This year, volunteer recruitment also occurred through contacting wait-listed volunteers from previous seasons.

Volunteer numbers reached 226 participants in 2022, the highest recorded for the program. Program capacity has expanded this year due to the Coast Watchers mobile app which has eliminated the need for a waitlist.

### Demographics

The demographics of the volunteers in 2022 included individuals from across the shoreline of various ages, from children to retirees, and of different socio-economic backgrounds. Some volunteers have participated in the program since 2014, while others were new in 2022.





**FIGURE 1: NUMBER OF PROGRAM VOLUNTEERS FROM 2006-2022.**

## Volunteer Training

With any community science program, training is very important to produce consistent results in the data collection. However, some aspects of Coast Watchers monitoring are qualitative and will have some form of variation from person to person. The training provided to participants in the Coast Watchers program equips volunteers with the necessary knowledge and experience to complete each monitoring session. Volunteers are trained on the use of equipment required to complete the reports.

Community volunteers are trained to observe environmental stressors when monitoring the shoreline through online resources including Coast Watchers protocol and recorded video training.

## Equipment

**Equipment inventory:** Existing volunteers were contacted in January to inquire about equipment in their possession. Other inventory in LHCC’s possession were inventoried and their condition inspected to ensure good working condition.

**Equipment distribution:** When equipment was in poor working order, or when volunteers needed new equipment, replacements or new equipment were distributed as needed. New volunteers have the option to print the Beaufort Scale, Compass Rose and field sheets from the Coast Watchers training page of the LHCC website yet the Beaufort scale can be accessed through the app. Considering the increase of registrations LHCC is unable to equip every Coast Watchers with a sensitive impeller used to report wind speed, air and water temperature called a Kestrel.

**Equipment costs:** Each Kestrel costs \$130 and each water thermometer costs 10\$. New volunteers that are interested in using a Kestrel pay a \$25 equipment deposit fee through the LHCC website. Once the equipment is returned in good condition the deposit is fully refunded back to the volunteer.

## Coast Watchers Pilot in Michigan

With the help of Huron Pines, Coast Watchers expanded to the American side of Lake Huron in 2022 by welcoming our first Michigan-based volunteers. Huron Pines shares many of the same conservation values as the Lake Huron Coastal Centre, making them an excellent partner for the Coast Watchers program. Their mission is to conserve and enhance Northern

Michigan's natural resources to ensure healthy water, protected places and vibrant communities. For almost 50 years, their work across the forests, lakes and streams of Northern Michigan has helped improve economic, environmental, educational, and recreational opportunities.

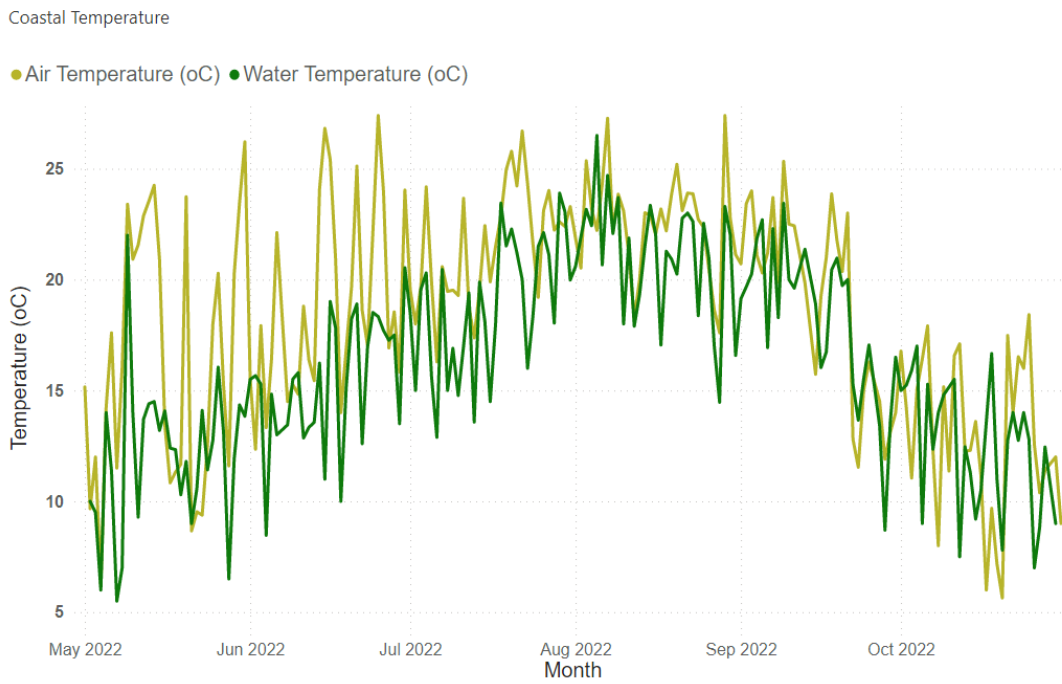
During the pilot, 10 enthusiastic volunteers monitored sections of shoreline along the 168-mile (270km) stretch from Tawas City, MI to Rogers City, MI. Volunteers attended an in-person training session at Mich-e-ke-wis beach in Alpena, MI to prepare them for the first monitoring season. One reason volunteers say they want to participate in the Coast Watchers program is to feel like they are "playing a small part in keeping Lake Huron safe." Some of the species the Michigan Coast Watchers observed were Monarchs, various gulls, turns and chickadees. Michigan Coast Watchers are asked to report observations of invasive species such as *Phragmites australis*, purple loosestrife and spotted knapweed. One of the participants said that their favorite part of the program was, "being part of a group working on a common cause to make a real difference." The information they collected will help to fill gaps in data collection along the Lake Huron coastline and ensure resiliency and sustainability on a lake-wide scale. Coast Watchers is dedicated to advancing long-term water quality protection, diversity of plant and animal life and supporting healthy, sustainable communities on both sides of the lake. Huron Pines is very excited to continue this partnership and offer the opportunity for Northeast Michigan residents to contribute to community science efforts in 2023.

## Results

The findings from the 2022 monitoring season range in quality from qualitative to quantitative measurements. The specific findings enable us to compare 2022 data to previous years to determine altered trend lines or common nuances over long-term data collections.

### Coastal Temperature (Air and Water)

Atmospheric temperatures are taken using a pool thermometer or Kestrel, depending on the equipment supplied to the volunteer. There were 1,754 data points recorded by volunteers for both air and water temperatures in 2022. Figure 2 shows the comparison of air and water temperature recordings from May 1<sup>st</sup> to October 31<sup>st</sup>, 2022. Temperatures are lower in both the spring and fall and peaked in the summer, with the maximum air temperature recorded in June and the maximum water temperature recorded in August. The maximum water temperature was 29°C and the maximum air temperature was 33°C (without the humidex). It is important to note that there are air temperature outliers in Figure 2 recorded early June. These can be attributed to human error, time of day, microclimate conditions experienced in some cove and shaded bluff bottom environments, or location of Coast Watchers participants sampling (i.e., Georgian Bay with steep nearshore decline vs. Southern basin with gradual nearshore decline).

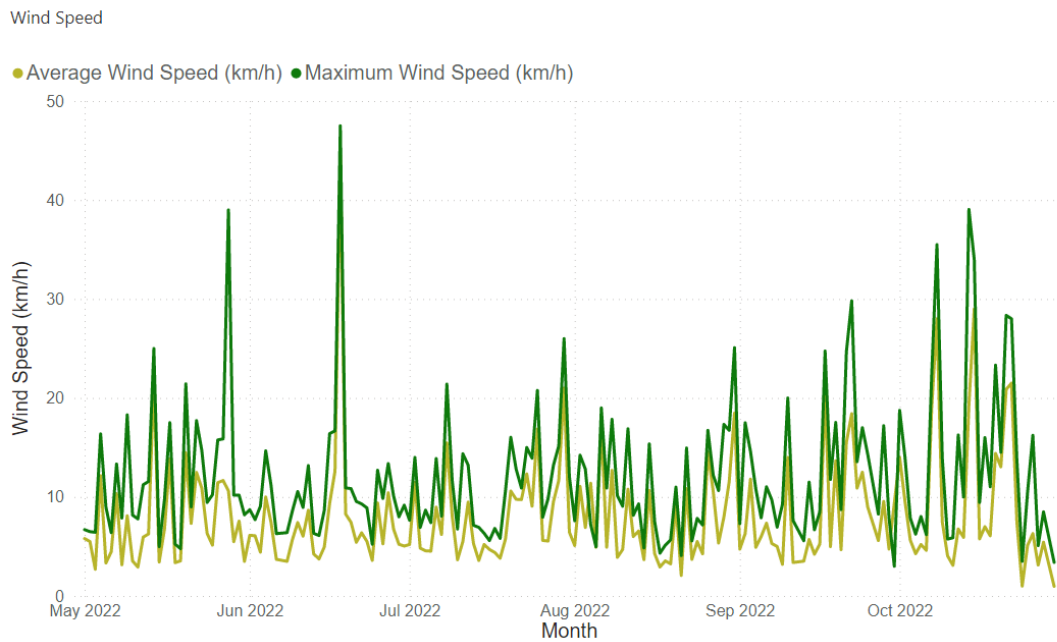


**FIGURE 2: COMPARISON OF AIR AND WATER TEMPERATURE (DEGREES CELSIUS) MEASUREMENTS RECORDED BY VOLUNTEERS FROM MAY 1<sup>ST</sup>, 2022 TO OCTOBER 31<sup>ST</sup>, 2022.**

### Wind Speed

Wind speed was measured for current wind speed, maximum wind gust, and average wind speed using a device called a Kestrel Wind Meter. The sensitive impeller in the device takes these readings by the operator holding it out in front of themselves at their monitoring location.





**FIGURE 3: COMPARISON OF AVERAGE WIND SPEED (KM/H) AND MAXIMUM WIND SPEED (KM/H) RECORDED BY VOLUNTEERS FROM MAY 1<sup>ST</sup>, 2022 TO OCTOBER 30<sup>TH</sup>, 2022.**

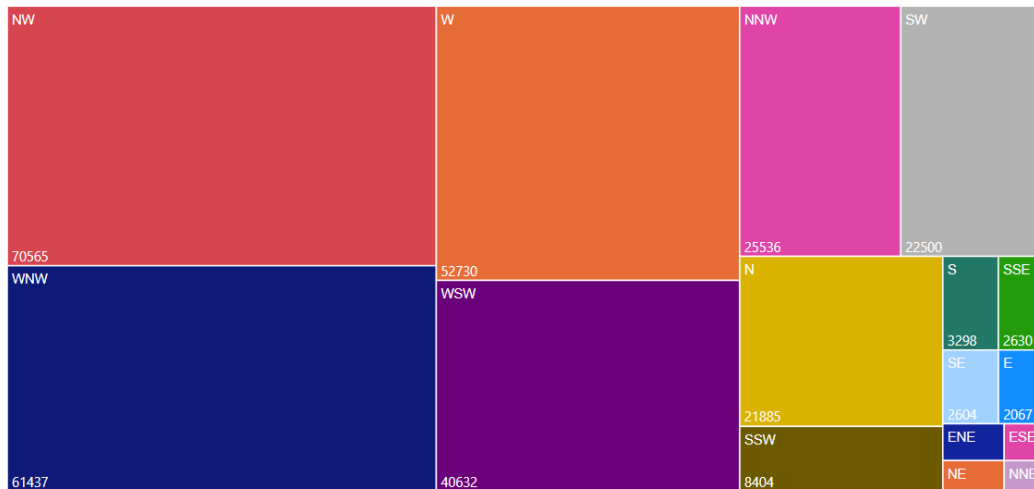
Figure 3 provides a comparison of maximum wind speed and average wind speeds (km/h). This graph shows that there were peaks in maximum and average wind speeds at the beginning and end of June, yet recordings varied day to day. This outlier could be attributed to human error or an inclement weather event. Although wind speed readings are accurate and have been recorded by the participant using the proper methodologies, there is some bias in the data. For example, if there was extreme inclement weather such as a thunderstorm or snowstorm, the participant may not have been able to record data during the weather event, excluding this reading from the data. This bias is attributed to human error. However, volunteers are encouraged to follow safety protocols during such weather events (i.e. avoiding collecting data during storms).

## Wind and Wave Direction

Wind Direction



Wave Direction



**FIGURE 4 & 5: WIND AND WAVE DIRECTION REPRESENTED BY A TREE MAP. THE LARGER THE BOX, THE HIGHER THE NUMBER OF RECORDED DATA POINTS FOR THE CORRESPONDING WIND AND WAVE DIRECTION. DATA WAS COLLECTED BY VOLUNTEERS FROM MAY 1<sup>ST</sup>, 2022 TO OCTOBER 31<sup>ST</sup>, 2022.**

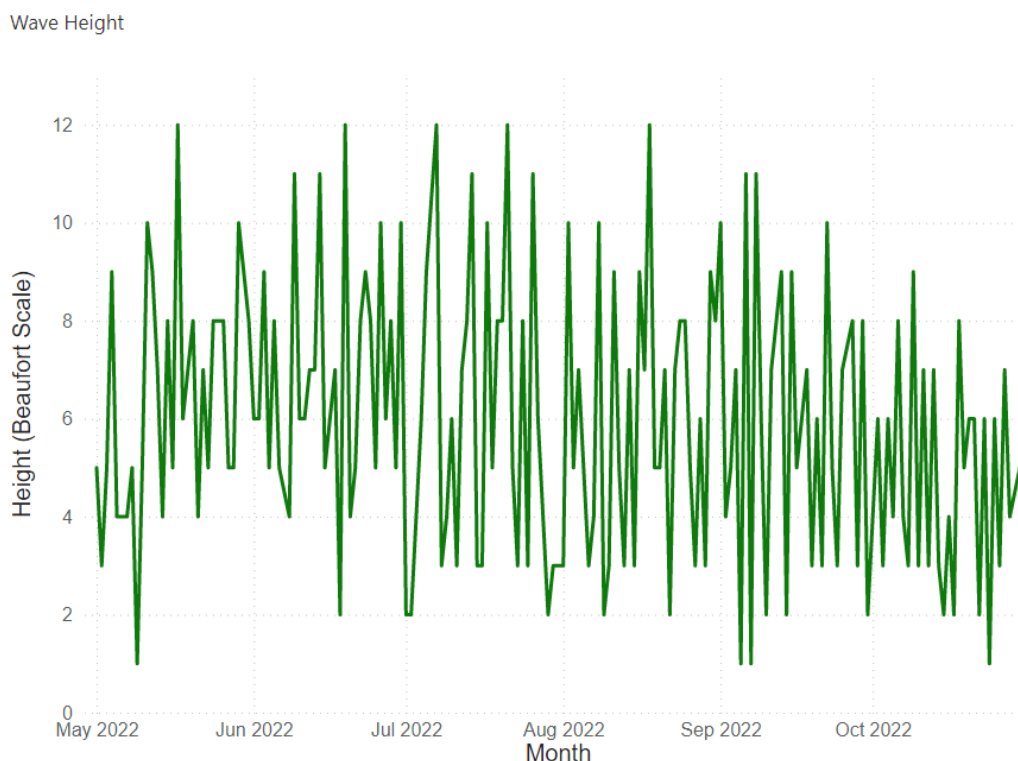
Figures 4 and 5 showing wind and wave direction are also variable depending on the time of year and location of the participant. Participants complete this section of the monitoring data using a device called a ‘Compass Rose’. During the 2022 season, the most common wind directions occurred from the Northwest, West Southwest, and Southwest direction with direct West impact; wave directions follow the same pattern. These recordings hold true to the typical conditions for

Lake Huron’s southeastern shores. The majority of winds come from across Lake Huron’s waters, originating ‘state-side’, flushing across the Lake, and proceeding across Southwestern Ontario.

### Wave Activity

Wave heights are monitored and quantified using the Beaufort Scale. The Beaufort Wind Scale, developed in 1805 by Sir Francis Beaufort of the U.K. Royal Navy, is a standardized method for mariners to measure and communicate wave heights and wind speeds. This method is used by Coast Watchers volunteers to monitor and record wave heights along the Lake Huron coastline. Although somewhat subjective to each participant’s experience and opinion, the Beaufort Scale employs wind speed to also indicate which Beaufort Scale number is appropriate. The Chart titled, ‘*Beaufort Wave Heights*’ illustrates how many records of each Beaufort scale number were made by participants throughout the study period. Figure 6 shows the time series of wave height using the Beaufort scale.

There were extreme wave height measurements during the 2022 season compared to previous years. The maximum wave height was reported 5 times from mid-May to mid-August which is uncommon on Lake Huron. Twelve (12), the maximum number on the Beaufort scale, can be described as hurricane force winds with a nearshore wave height of more than 4.5 meters. These outliers are likely due to a gap in training on how to properly read the Beaufort scale using the new online reporting system. To remedy this issue, more information about how to read and understand the Beaufort scale should be included on the Coast Watchers mobile application.

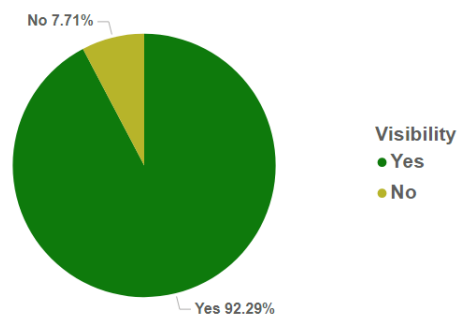


**FIGURE 6: TIME SERIES OF WAVE HEIGHT (BEAUFORT SCALE) BY VOLUNTEERS FROM MAY 1<sup>ST</sup>, 2022 TO OCTOBER 31<sup>ST</sup>, 2022.**

## Visibility

Visibility is defined as a measure of the distance at which an object can be clearly discerned, affecting boating, and daily activities on the shoreline. Visibility recorded over time can be used to assess trends in atmospheric conditions and qualitative air quality. If the horizon is apparent and clearly visible, the observant notes that 'Yes' the horizon is visible. If the horizon is clouded by fog, or if the cloud and sky blurred together 'No' is recorded.

Figure 7 shows the division of observations of visibility. 1,115 observations were made over the 2022 season and 92.2% of observations stated that the horizon was visible.



**FIGURE 7: RESULTS DEPICTING PERCENTAGE OF DATA RECORDINGS FOR THE HORIZON VISIBILITY (YES OR NO).**

## Wildlife Reports

Coast Watchers volunteers identified 51 species at the Lake Huron shoreline during the 2022 season. Similar to 2021, the most common observations were birds including Gulls (Ring-Billed), Canada Geese, Ducks (Mallard and Mergansers), Cormorants, and Crows, but also included Kingfishers, Swans, and many more (see Figures 8 & 9).



**FIGURE 8 & 9: NORTHERN LEOPARD FROG (LEFT). RING-BILLED GULLS ON SAND(RIGHT). FIGURE 8 PROVIDED BY COAST WATCHERS PARTICIPANT CW2 16**

## Die-off Events

Three reports of Zebra Mussel die-offs occurred in 2022, a common invasive species found in Lake Huron. Reports of 200 and 300 Zebra Mussel shells were reported in mid-June followed by over 1000 Zebra Mussel shells reported on September



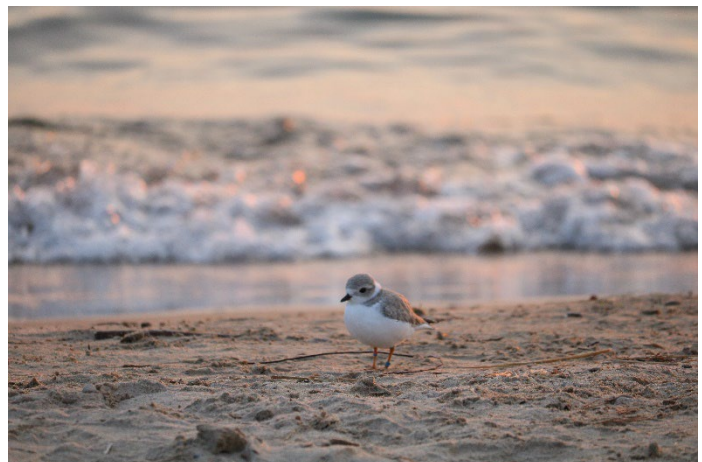
5<sup>th</sup>. All reports occurred at the same monitoring location (see Figures 10 & 11). A die-off event of invasive species at this scale could be evidence of an unbalanced lake ecosystem.



**FIGURE 10: ZEBRA MUSSEL SHELLS WITHIN NATURAL DEBRIS. PHOTO PROVIDED BY COAST WATCHER PARTICIPANT CW 184.**

### Species at Risk

43 reports of species at risk were recorded in 2023. Monarch Butterfly was the most common species at risk reported with 63 sightings, followed by Barn Swallows at 10 sightings. Observations also including sightings of Piping Plover (Figure 12) and Bald Eagle. The margin of error on Species at Risk recordings is larger than general wildlife reports because differentiating between these species and look-a-like counterparts can be difficult for community scientists. However, participants in the Coast Watchers program receive training and identification guides to learn how to identify the most common Species at Risk observed on Lake Huron shorelines.



**FIGURES 11 & 12: MONARCH BUTTERFLY IN SAND (LEFT), PIPING PLOVER ON BEACH (RIGHT). FIGURE 11 PROVIDED BY COAST WATCHERS PARTICIPANT CW 184.**

## Algae Reports

Algae occurs naturally in aquatic ecosystems and is a vital part of the food chain for benthic invertebrates and fish species. Large quantities of algae can be indicative of excessive nutrients like nitrogen and phosphorous entering the water from runoff. Algae fouling along beaches is an example of an ecological imbalance due to excessive nutrients in the water. Algae wash-ups from the lakebed can also occur due to storm action.

Algae blooms are popularly known to cause a poor-quality swimming environment, a “rotten” smell when washed up on beaches, and generally a displeasing aesthetic. Some algae are also known to contain toxic qualities such as cyanobacteria which can make humans and animals ill if consumed. Algae is problematic in nearshore waters because of its effect on the Dissolved Oxygen (DO) content of the water column. Fish and aquatic species rely on DO in water, and when DO is being consumed by algae either in its growth or decomposition stage, there is less for fish to utilize, which may lead to fish die-off events. The presence of algae blooms is important to monitor to detect changes in nearshore water quality that may trigger negative impacts to the health of nearshore ecosystems and aquatic wildlife habitat.

During the 2022 monitoring season, Coast Watchers documented 41 algae sightings in the water and 60 sightings on the beach. Shoreline was the most common environment where algae was found; most of the algae was reported to have no odor, and the most common colour noted was olive green. Based on qualitative characteristics volunteers determined that the most common algae type was Filamentous.



**FIGURES 13 & 14: ALGAE PRESENT ON SAND BEACH (LEFT) AND ALGAE WASH-UP ON ROCKS (RIGHT). PHOTOS PROVIDED BY COAST WATCHERS PARTICIPANTS CW132 & CW196.**

## Beach Litter

Plastic debris and litter on beaches are not only aesthetically displeasing but also pose a health and safety risk to humans and animals using the shoreline. Litter on shorelines becomes an entanglement hazard for wildlife and can be consumed by birds and fish, leading to choking, starvation, bioaccumulation, or biomagnification. This season microplastic was added to the Plastic Watch report. Microplastic is defined as any plastic item or fragment less than 5 millimeters in size. The most common microplastics are microbeads, fibers, fragments, nurdles, and foam.

In many public beach areas, municipalities groom beaches using mechanical methods such as tractor-towed surf rakes and algae harvesters. This form of beach grooming can pose environmental stress by also removing natural habitat that wildlife



depends on. Landowners that live along areas of the shoreline that do not have public access are responsible for cleaning up inorganic matter that washes onto the shore.

Coast Watchers participants are asked to monitor and record inorganic litter (e.g., plastic, metal, glass, etc.) that is present on the shoreline during the time of their monitoring. 283 total recordings of litter and microplastics were made in 2022. The most common type of litter found was cigarette butts, food wrappers, plastic bags, and plastic bottles. The most common microplastic recorded was plastic fragments. A total of 80 kg (177 lbs) of litter was removed by Coast Watchers this season.



**FIGURE 15 & 16: FIREWORK COLLECTED BY A COAST WATCHERS (LEFT). BALLOON CAUGHT IN TREE (RIGHT). PHOTOS PROVIDED BY COAST WATCHERS PARTICIPANTS CW132 & CW194.**

## Storm Damage & Erosion Reports

### Water Levels

Lake Huron experienced its peak water level for the year in June and July of 2022, at 176.81 metres above sea level compared to the near-record high water level of 177.45 m in July 2020. Water levels decreased throughout the rest of the year, yet even with the steady decline, above average water levels were recorded at the end of 2022. Lake levels are projected to continue declining in 2023 (NOAA, 2023). High lake levels contributed to erosion events through increased wave action causing concern for lakeshore property owners. In 2022, 69 observations were reported of erosion including beach terracing, precipitation erosion such as washouts, and exposed roots in dune areas (see Figures 19 & 20).

Although shoreline erosion is a natural process, areas experiencing washouts from surface runoff and intense precipitation events should be monitored as this may indicate improper rainwater catchment and infiltration. Incorporating Low Impact Development (LID) principles to reduce this phenomenon can include rainwater catchment systems attached to structures, infiltration gardens such as rain gardens, more permeable, natural and vegetated cover, and increased buffer zones between built areas and the high-water mark.

### Natural and Human Made Debris Wash-up

Storm events often cause powerful waves resulting in wash-ups of large natural debris. This often causes concern from residents who have narrow shorelines with nowhere to take the natural debris to properly remove it from the shoreline if it is causing a hazard or impediment to recreational activities. While natural material is important to feed nutrients into shorelines, it is recognized that excessive amounts of natural debris are not typically compatible with human demands for

recreation on shorelines. 523 reports of large natural debris, such as driftwood, logs, clumps of natural material such as root balls, and rocks were recorded throughout the season.

133 observations of large, human-made debris were recorded, including large concrete blocks, metal, fire pit rings, plastic furniture, barrels, tires, and asphalt chunks. These large, inorganic materials are necessary to remove to protect the ecological integrity of the beach, along with removing the safety hazard for humans and wildlife. Often, landowners do not have the required equipment or know how to properly dispose of these materials, therefore causing concern and confusion.



**FIGURE 17: EXAMPLE OF HUMAN MADE DEBRIS WASH-UP ON SHORELINE. PHOTO PROVIDED BY COAST WATCHER CW174.**

### **Human Activity on Shoreline**

Human activity is recorded to gain insight into the influence recreation has on Lake Huron’s coastal environment. In 2022, the number of people on beaches was the highest recorded human activity, with an estimated total count to be 5,647 people observed by Coast Watchers. Observations of watercraft without motors such as kayaks, canoes, stand up paddleboards, sailboats, and wind surfers were recorded as 1,198, whereas 456 watercrafts with motors were recorded. 105 motorized vehicles were recorded in these observations which included ATV’s, tractors and trucks on the shoreline; Other observations around vehicle use included observations of tracks but no vehicle, implying a vehicle had recently been along the shore.



Aside from noting human activity, participants also recorded dogs seen on the beach since off leash dogs can cause mortality to wildlife on beach. In total, 414 dogs were recorded along the shoreline (see figure 21).



**FIGURE 18 & 19: CONSTRUCTION ON BEACH (LEFT). MOTORIZED VEHICLE TIRE MARKS ON BEACH (RIGHT). PHOTO PROVIDED BY COAST WATCHERS PARTICIPANTS CW162 & CW184.**

Understanding how and why people are using the shoreline directs shoreline management strategies and assists with the proper education and outreach techniques to prevent excessive pollution, habitat destruction, and exceeded ecological carrying capacities of shoreline ecosystems.

### Human Activities



**FIGURE 20: REPRESENTED BY A TREE MAP OF HUMAN ACTIVITIES RECORDED ALONG THE LAKE HURON AND GEORGIAN BAY SHORELINE FROM MAY 2022 TO OCTOBER 2022. THE LARGER THE BOX, THE HIGHER THE NUMBER OF RECORDED DATA POINTS FOR THE CORRESPONDING ACTIVITY. THE BURGUNDY BOX WITH 456 DATA POINTS REPRESENTS MOTORIZED WATER ACTIVITIES. THE DARK BLUE BOX WITH 105 DATA POINTS REPRESENTS MOTORIZED VEHICLES ON THE BEACH.**

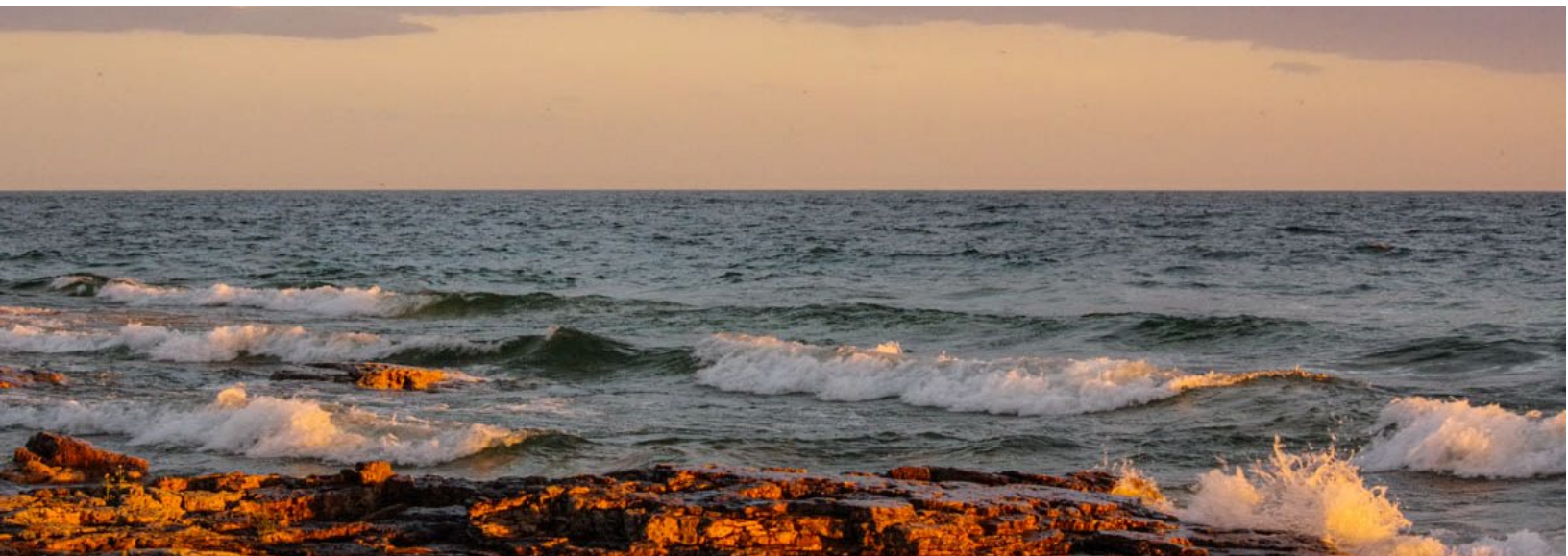
## Lessons Learned

The launch of the Coast Watchers mobile application in 2022 reduced the margin of human error and increased the efficiency of data sharing and analysis. It allowed for the geographic expansion of the program that covered more areas of the shoreline and increased program capacity. Coast Watchers volunteers provided feedback about how to improve the application for next season. A survey should be sent every year to consolidate responses and bug fixes/updates should occur before each season. An on-demand training system will be developed for 2023 to streamline the onboarding process.

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COMMUNITY VOLUNTEER PROGRAM

**2022**

**Thank you to the dedicated Coast Watchers volunteer community  
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